

Research on the Development Trend of Logistics under the background of Industry 4.0

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Abstract

The advent of the fourth industrial revolution (industry 4.0) has promoted the upgrading and transformation of various industries in the world. Logistics industry, as one of the three themes of "Industry 4.0", is striving to upgrade from the traditional mode in an all-round way. The rapid development of logistics industry has a great impact on the whole industry chain. Therefore, it is particularly important to study the overall development trend of logistics industry. It can not only point out the important role of logistics industry, but also make a comprehensive analysis of logistics industry. By studying the important role of logistics industry in industry 4.0 environment, this paper further points out the overall development trend of logistics industry: the new round of industrial transformation of logistics is not only towards intellectualization, but also attaches great importance to coordinated development with related industries, maximization of social resources and environmental protection work.

Keywords

Smart logistics, development collaboration, socialize resources.

1. Industry 4.0

Industry 4.0 (Industry 4.0) is a high-tech project proposed by a German scientific research alliance, which is supported by the Federal Ministry of Education and Research and the Federal Ministry of Economy and Technology. With the strong support of the German government, industry 4.0 has been upgraded to a national strategy, and has become one of the ten key projects in the "German 2020 high-tech strategy". In 2013, the standardization roadmap of industry 4.0 was officially released at the Hanover Industrial Exposition, marking that the fourth industrial revolution has been fully launched and has entered the stage of implementation.

Industry 4.0 is the sublimation of human society after industry 1.0, 2.0 and 3.0. Industrial 1.0 was born in the eighteenth century, which was an industrial revolution with machinery as the main force of production. During this period, the steam engine invented by human beings replaced the manual labor of traditional production, improved production efficiency, and formally evolved from handicraft and agriculture to mechanized manufacturing; Industrial 2.0 took place in the late 19th century and continued to the early 20th century, and electric power gradually replaced the operation of hydraulic-driven machines and began the industrial large-scale production mode; The middle and late 20th century was the electronic information age of industrial 3.0. The birth of electronic information technology makes machinery take over part of mental work while replacing human and physical labor, and realize full automation and partial information manufacturing. In the 21st century, the growing popularity of new generation information technology such as the Internet has brought huge challenges to manufacturing industry, and there is a serious conflict between customers' requirements for product individualization and large-scale production of manufacturing industry. Therefore, the intelligent manufacturing industry is the inevitable trend of industrial development, but also the reason for the birth of industry 4.0.

The goal of industry 4.0 is to achieve intelligent manufacturing. The components of intelligent manufacturing (or the three themes of industry 4.0) include intelligent production, intelligent factory

and intelligent logistics. Intelligent manufacturing means that based on information logistics system (CPS), with the help of modern information technology such as cloud computing, big data, Internet and other technologies, manufacturing industry will be transformed to intelligent direction. The five characteristics of industry 4.0 include:

+) Interconnection: Industry 4.0 interconnection is closely linked to equipment, production lines, factories, suppliers, products and customers to shorten the distance between the virtual world and the real world.

+) Data: All business and equipment related to manufacturing industry will produce data in the production process, while CPS system, sensors and various information technologies will further perform related tasks, such as data processing, data management, etc. on the basis of connecting all data.

+) Integration: Through the wide application of sensors and CPS systems, it connects human, machine and service to achieve a high degree of integration.

+) Innovation: Industry 4.0 is based on modern information technology, which requires appropriate innovation and change in manufacturing mode, technology, organization and other aspects in order to keep up with the pace of the new era.

+) Transition: from traditional manufacturing to intelligent manufacturing in the industry 4.0 era, from traditional mass production to customized production.

In a word, industry 4.0 is an industrial development mode of a new era and an inevitable result of the Internet era. The development of industry 4.0 has brought great impact to various industries, especially the traditional manufacturing industry. In order to meet the requirements of the new industrial revolution, traditional manufacturing industry has to step into the direction of intelligence. As an important support of manufacturing industry, logistics industry has also been transformed to smart logistics.

2. The importance of Logistics in Industry 4.0

Intelligent manufacturing of industry 4.0 must be accomplished through the combination of intelligent factory, intelligent production and intelligent logistics. Intelligent factory focuses on intelligent production system and production process, realizing networked and intelligent production facilities. The core of intelligent production lies in logistics management system, man-machine interaction and the application of 3D printing in production process. Therefore, logistics industry is an important support for intelligent factory and intelligent production, and a key factor to realize intelligent manufacturing.

Promoted by the big wave of industry 4.0, the development of intelligent manufacturing is irresistible, and intelligent factory is an important cornerstone to realize intelligent manufacturing. In intelligent factory, logistics is not only the connection between the supply of raw materials and production, but also the bridge between finished goods and customers. Intelligent logistics realizes the intellectualization of material supply in factory production. It makes use of intelligent warehousing equipment, ERP, WMS and other systems to get through the information flow between warehouse and production site, and realizes the automatic discharge of materials. Intelligent logistics connects the production equipment, core hardware and customer information in the factory through logistics management system and connects them in real time. Interaction and communication, work together to complete production data acquisition, condition analysis, manufacturing decisions and other tasks; with the lowest cost, the shortest mileage and the fastest time to deliver products to the customer location. Intelligent logistics plays a connecting role in the intelligent factory, breaking through the information barriers between customers and factories, realizing production automation, and serving the intelligent factory from production, distribution, marketing and other aspects in an all-round way. So logistics is an indispensable part of intelligent factory.

In addition, the rise of intelligent factories has also promoted the development of intelligent production. It applies modern technology such as intelligent logistics management system and 3D printing to all aspects of production process to realize individualized, flexible and networked production mode. With the help of 3D printing technology, intelligent production can provide small batch and personalized production services for individual customers, satisfy customers' individualized demand for products, shorten product innovation cycle and accelerate the production rhythm of products. Therefore, the docking ability of intelligent production mode to logistics distribution is constantly improving to adapt to the rhythm of rapid production, which is undoubtedly a huge challenge to logistics distribution.

In summary, logistics industry plays a very important role in industry 4.0. Without logistics, intelligent factory and intelligent production cannot be realized. At the same time, logistics industry is also a key link point, which makes each subject achieve the best effect in the process of informatization and intellectualization.

3. Development Trend of Logistics Industry in the Background of Industry 4.0

The world has entered the era of industry 4.0. Under the background of industry 4.0, AI has made continuous breakthroughs and achieved unprecedented achievements. With the continuous improvement of artificial intelligence, Internet + and various modern information technology, the logistics industry has brought enormous development space. In order to meet the requirements of the 4.0 era, the logistics industry needs continuous improvement and upgrading. In recent years, the development trend of logistics industry is not only steadily moving towards "intelligent" development, but also improving in all aspects.

3.1 Intelligent Warehouse

Warehouse is an important part of industrial production and logistics distribution. However, the intelligent manufacturing industry advocated in the industry 4.0 era is also developing rapidly, which makes the product renewal cycle shorter and shorter, which brings great challenges to warehouse storage. In addition, with the rapid development of advanced information technology, the traditional manual warehousing and manual operation machinery warehousing with high cost and efficiency have been unable to meet the high requirements of modern manufacturing industry for logistics warehousing. Therefore, in order to reduce labor costs, prevent potential safety hazards and improve operational efficiency, the new model of intelligent warehouse will gradually replace the traditional warehouse with cumbersome process and become the mainstream of the new generation warehouse in logistics industry. Intelligent warehousing is a kind of warehouse which can complete all the business by machine instead of manual work, such as receiving, sorting, handling, storing and discharging. In addition, the unmanned intelligent warehouse can also achieve a high degree of concentration, make full use of the warehouse area, warehouse height can reach more than 20 meters, improve land use efficiency. Because the intelligent warehouse is mainly supported by various modern information technologies, all business in the warehouse is controlled by the information management system inside the warehouse, which can not only grasp the dynamics of commodity storage, but also adjust according to the specific situation [3].

Technically, the warehouse uses radio frequency identification technology, also known as "electronic trademark" (RFID), to identify specific targets and read and write related data through radio waves, without establishing mechanical or optical contacts between the identification system and specific targets, and to identify goods in batches and remotely through electronic tags, so as to achieve goods tracking and data exchange, and reduce labor costs at the same time. To improve work efficiency, in the field of intelligent warehouse, RFID technology plays a key role in warehouse inspection, goods replenishment and collation, order filling and out-of-warehouse transportation, so as to achieve the goal of visualization of warehouse management and product traceability.

Positioning technology (GPRS): Satellite navigation and positioning technology and RFID technology are the key basic technologies of intelligent warehouse management visualization. In

warehouse, if the robot wants to achieve precise operation, it must combine navigation and positioning with radio frequency identification technology.

In communication, the network protocol of NB-IOT, LORA or ZIGBEE is adopted.

In software, it is necessary to adopt the integrated management system of goods from warehousing, sorting, warehousing and other processes.

In terms of equipment, intelligent warehousing should have the following equipments: handling equipment, handling equipment, storage equipment, picking equipment, intelligent loading equipment, review equipment, packaging equipment, etc. Utilize modern information technology, cooperate with intelligent equipment, build intelligent warehouse, realize warehouse unattended processing, visualize logistics information, effectively improve warehouse management level and operational efficiency.

3.2 Socialization of Logistics Resources

The socialization of logistics resources refers to the externalization of the logistics business originally completed by the professional departments of enterprises. That is to say, the company will transfer the functions of transportation, handling and storage needed in the process of distribution, production and supply to the professional company. With the development trend of global economic integration, competition among enterprises is gradually transformed into competition among industrial clusters. Therefore, the traditional concept of ownership no longer meets the requirements of the times, and the socialization of logistics resources can break the gap between traditional enterprises and make full use of the social stock resources and idle resources. For example, rookie Posts make use of existing social resources such as universities, communities, convenience stores and so on to become their own logistics distribution stations, greatly improving the efficiency of distribution and reducing the cost of establishing distribution stations [4].

On the other hand, the socialization of logistics resources is based on the specialization of social division of labor. In the industry 4.0 era, customers' requirements for product individualization make manufacturing enterprises constantly improve their production processes, and the competition among enterprises becomes very fierce. In order to ensure the normal operation of enterprise production or improve production efficiency, many manufacturing enterprises began to choose third-party logistics companies, from enterprise logistics to social logistics.

3.3 Supply Chain Integration and Data Dynamization

The fierce market competition makes every enterprise face enormous competition pressure. In order to gain a firm foothold in the market, enterprises have to reduce costs, improve the quality of products and services, and circulation efficiency through various ways. In fact, no enterprise can compete with all its competitors alone, but needs the overall strength of cooperation among enterprises as the core competitiveness. As a result, supply chain integration was born. Supply chain integration refers to the formation of an interconnection between suppliers, manufacturers, distributors, logistics and customer service to the terminal, so as to change the "vertical integration" business model of enterprises into a modern "horizontal integration". The integration of supply chain can help the logistics industry to achieve a higher pace of development, and make logistics, business flow, capital flow and information flow become a "four-in-one" development model. Supply chain integration can solve the information gap between suppliers, manufacturers, distributors and customers in the traditional production mode, thus reducing the comprehensive cost, expanding market demand, achieving the goal of zero inventory, and making the logistics business achieve the highest operational efficiency [5].

Supply chain integration is based on all kinds of modern information technology in the Internet era. It carries out data processing, analysis, management and other related work through the information and data transmitted by the equipment management system. Therefore, data dynamics plays an important role in the development of intelligent logistics. Logistics network system collects data in every link of the production process, and carries out data processing and analysis. It further operates data mining

from the acquired information, and analyses the potential information, which provides the basis for manufacturers to improve their products, and helps logistics enterprises to make their own business and service optimization decisions.

3.4 Informatization + Industrial Cooperative Development

In the Internet era of the 21st century, informationization is the foundation of everything. Without informationization, logistics can not apply any advanced technology and equipment. The informatization of logistics is manifested in the commercialization of logistics information, the database and codification of logistics information mobile phone, the electronic processing of logistics information, the standardization and real-time transmission of logistics information, and the digitalization of logistics information storage. In order to realize logistics informationization, logistics enterprises should adopt a series of information technologies, such as bar code technology, database technology (EOS), electronic data exchange and so on. Logistics informationization is an important cornerstone of the development of modern logistics industry and the key to the success or failure of logistics industry.

On the basis of information construction, Industrial Synergy Development is also one of the development trends of logistics industry. The so-called industrial coordinated development refers to the cooperation and coordinated development between logistics industry and manufacturing industry. In fact, manufacturing and logistics are interactional, mutually supportive and mutually serving. Manufacturing industry provides facilities and technical support for logistics, while logistics provides manufacturing industry with productive services. Therefore, as long as one of them lags behind the other, it will become a stumbling block for the development of the other. On the other hand, in the manufacturing industry, the production and processing links only account for 10% of the time, while the rest of the time belongs to logistics warehousing and transportation links. It can be seen that the efficiency of logistics can directly affect the operation effect of manufacturing industry, on the contrary, the level of manufacturing industry also determines the success or failure of logistics industry. In a word, the relationship between manufacturing industry and logistics industry is inseparable. The integration and coordinated development between them can establish a stable industrial chain and create a good space for their development.

3.5 Green Logistics

With the development of global economy paying more and more attention to environmental protection, green logistics has become one of the development directions of logistics industry in the future. Logistics will purify the logistics environment and make full use of logistics resources through green packaging, green transportation and green warehousing.

- 1) Green Packaging: Packaging is one of the most basic business of logistics. Logistics can use recyclable materials as goods packaging, reduce resource consumption, while conducive to environmental protection.
- 2) Green Warehousing: Logistics reduces the damage to the environment by choosing reasonable warehousing address, builds intelligent warehousing, makes full use of modern information technology, replaces paper-based information technology, and reduces resource consumption.
- 3) Green Transportation: Logistics transportation is one of the most serious logistics links that cause environmental pollution. Reasonable layout and planning of transport routes can effectively reduce fuel and exhaust emissions of transport vehicles, and increase the use of new energy transport tools, so as to do a duty for environmental protection.

4. Conclusion

Industry 4.0, which originated in Germany, has attracted great attention all over the world. It marks the arrival of the tide of information technology in human society and is a new revolution in global industry. Faced with the huge wave of industry 4.0, manufacturing industry as a core project is gradually realizing industry transformation. As the connection between manufacturing industry,

suppliers and customers, logistics industry is also trying to adapt to the intelligent development pattern, and the overall development and upgrading of industry. Because the manufacturing industry can produce well, but it cannot be fully utilized without the support of logistics industry, so the intelligent manufacturing industry and intelligent logistics industry need to coordinate development, mutual support to make the two industries reach new heights.

In the process of global economic integration, logistics industry is an indispensable part. It is not only the connection between manufacturers and customers, but also the economic connection between countries, which undertakes an important mission. Industry 4.0 is the key period of the new round of industrial transformation of logistics. Logistics will upgrade and gradually improve its industry status by realizing the intellectualization of warehouse, socialization of logistics resources, integration of supply chain and data dynamics, information technology and industrial coordinated development and green logistics, and become one of the most critical links of global economic integration.

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